

# Document made available under the Patent Cooperation Treaty (PCT)

International application number: PCT/US04/042880

International filing date: 17 December 2004 (17.12.2004)

Document type: Certified copy of priority document

Document details: Country/Office: US  
Number: 60/587,637  
Filing date: 13 July 2004 (13.07.2004)

Date of receipt at the International Bureau: 24 January 2005 (24.01.2005)

Remark: Priority document submitted or transmitted to the International Bureau in compliance with Rule 17.1(a) or (b)



World Intellectual Property Organization (WIPO) - Geneva, Switzerland  
Organisation Mondiale de la Propriété Intellectuelle (OMPI) - Genève, Suisse



# THE UNITED STATES OF AMERICA

TO ALL TO WHOM THESE PRESENTS SHALL COME

UNITED STATES DEPARTMENT OF COMMERCE

United States Patent and Trademark Office

*January 14, 2005*

THIS IS TO CERTIFY THAT ANNEXED HERETO IS A TRUE COPY FROM THE RECORDS OF THE UNITED STATES PATENT AND TRADEMARK OFFICE OF THOSE PAPERS OF THE BELOW IDENTIFIED PATENT APPLICATION THAT MET THE REQUIREMENTS TO BE GRANTED A FILING DATE.

APPLICATION NUMBER: 60/587,637

FILING DATE: *July 13, 2004*

RELATED PCT APPLICATION NUMBER: *PCT/US04/42880*



Certified By

Jon W Dudas

Under Secretary  
of Commerce for Intellectual Property  
and Acting Director of the  
United States Patent and Trademark Office

22713 U.S. PAT  
071304

U.S. PATENT AND TRADEMARK OFFICE  
APPENDIX A

PROVISIONAL APPLICATION COVER SHEET

This is a request for filing a **PROVISIONAL APPLICATION** under 37 CFR 1.53 (b)(2)

17510 U.S. PTO  
60/587637  
071304

INVENTOR(s)/APPLICANT(s)			
Last Name	First name	Middle Initial	Residence (City and Either State or Foreign Country)
Gutman	Felix		San Jose, California
Chokshi	Himanshu	J.	Fremont, California
Hui	Wang		Fremont, California
TITLE OF INVENTION (280 Characters max)			
Two Electrode Chuck for Improving Removal Rate Uniformity During Electropolishing			
CORRESPONDENCE ADDRESS			
ACM Research, Inc, 46520 Fremont Blvd., Suite #610, Fremont, CA 94538			
State	California	Zip Code	94538
Country	USA		
ENCLOSED APPLICATION PARTS (check all that apply)			
<input checked="" type="checkbox"/> Specification	Number of Pages: 2	<input checked="" type="checkbox"/> Application Data Sheet (2pps)	
<input checked="" type="checkbox"/> Drawing(s)	Number of Sheets: 5	<input type="checkbox"/> Other (specify)	
METHOD OF PAYMENT (CHECK ONE)			
<input checked="" type="checkbox"/> A check or money order is enclosed to cover the Provisional filing fees			PROVISIONAL FILING FEE AMOUNT (\$) 80.00

The Invention was made by an agency of the United States Government or under a contract of an agency of the United States Government.

☒ No

☐ Yes, the name of the U.S. Government agency and the Government contract number are:

Respectfully submitted,

SIGNATURE

Date July 13, 2004

TYPED or PRINTED NAME

Hui Wang

REGISTRATION NO.

(if appropriate)

☐ Additional inventors are being named on separately numbered sheets attached hereto.

PROVISIONAL APPLICATION FILING ONLY

Express Mail Label Number: \_\_\_\_\_

Date of Deposit: July 13, 2004

I hereby certify that this paper or fee is being deposited with the United States Postal Service "Express Mail Office to Address" service under 37CFR 1.10 on the date indicated above and is addressed to the Assistant Commissioner for Patents, Washington, D.C. 20231

**Date:** \_\_\_\_\_ **By:** \_\_\_\_\_

## **TWO-ELECTRODE CHUCK FOR IMPROVING REMOVAL RATE UNIFORMITY DURING ELECTROPOLISHING**

Two-electrode chuck is an apparatus for holding semiconductor workpieces (wafers) during electropolishing process. It provides electrical power to the wafer through two different paths as well as vacuum and gas (nitrogen, air, etc.) necessary for the chuck functioning. For detail operation mechanism, please see US patent application ser.No. 60/332, 417, entitled ELECTROPOLISHING ASSEMBLY, filed on November 13, 2001; No. 60/372, 567, entitled METHOD AND APPARATUS FOR ELETROPOLISHING METAL FILM ON SUBSTRATE, filed on April 14, 2002; and PCT patent application No. PCT/US 02/36567, entitled ELETROPOLISHING ASSEMBLY AND METHOD FOR ELETROPOLISHING CONDUCTIVE LAYERS, filed on November 13, 2002, all of which are incorporated herein by reference in their entirety.

Fig. 1 shows exploded view of two-electrode chuck assembly including major subassemblies.

Fig. 2 shows exploded view of two-electrode chuck shaft.

Fig. 3 shows exploded view of two-electrode chuck top assembly.

Fig. 4 shows exploded view of two-electrode chuck bottom assembly.

Fig. 5 shows section view of two-electrode chuck bottom assembly.

With reference to Fig. 1 two-electrode chuck assembly includes shaft assembly **101**, top assembly **102**, bottom assembly **103**, rotary union **104**, electrical contact assembly **105** with upper **111** and lower **112** contact, pins **106**, and compressions springs **107**.

Shaft **101** and rotary union **104** support chuck spinning during process. They also supply spinning chuck with vacuum to hold and seal wafer and compressed gas to help remove wafer after process finished. Electrical contact assembly **105** provides spinning chuck with electrical power from two independent sources. Chuck top assembly **102** and chuck bottom assembly **103** connected together with two or more pins **106** and compression springs **107**. Chuck can be open to load wafer and then closed to hold it and seal edge of the wafer during process.

With reference to Fig. 2 shaft assembly includes shaft **201**, upper contact ring **202**, lower contact ring **203**, lower contact ring insulator **204**, contact pin **205**, contact pin insulator **206**, contact rod **207**, contact rod insulator **208**, contact rod holder **209**, spring contact **210**.

With reference to Fig. 3 top assembly includes block 301, to or more vacuum and gas channels 302, contact screw 303, contact screw insulator 304, contact nut 305, contact nut insulator 306, wire 307, wire insulator 308, clamps 309, cover 310, top plate 311, top plate inserts 312, metal plate 313, bottom plate 314, and two or more leaf spring contacts 315.

With reference to Fig. 4 bottom assembly includes bottom ring 401, outer gasket 402 which tighten to the bottom ring with clamp ring 403, inner ring 404 which tighten to the bottom ring with wafer centering ring 405, screw insulators 406 and plugs 407 to insulate the centering ring from bottom ring, cones 408 to direct wafer, and wafer contact spring 409.

With reference to Fig. 5 in addition to items listed above shown insulating layer 501 on top surface of bottom ring, screws 502, and spring wire 503 that keeps wafer contact spring 409 in place.

Electrical power (potential) to the chuck can be provided through two independent circuits (paths). The first path includes with reference to Fig. 1 lower contact 112 of electrical contact assembly 105, with reference to Fig. 2 lower contact ring 203, shaft 201, with reference to Fig. 3 block 301, metal plate 313, leaf spring contacts 315, with reference to Fig. 4 wafer centering ring 405, and wafer contact spring 409.

The second path includes with reference to Fig. 1 upper contact 112 of electrical contact assembly 105, with reference to Fig. 2 upper contact ring 202, contact pin 205, contact rod 207, spring contact 210, with reference to Fig. 3 contact screw 303, contact nut 305, wire 307, top plate inserts 312, with reference to Fig. 1 compression springs 107, pins 106, and with reference to Fig. 4 bottom ring 401.

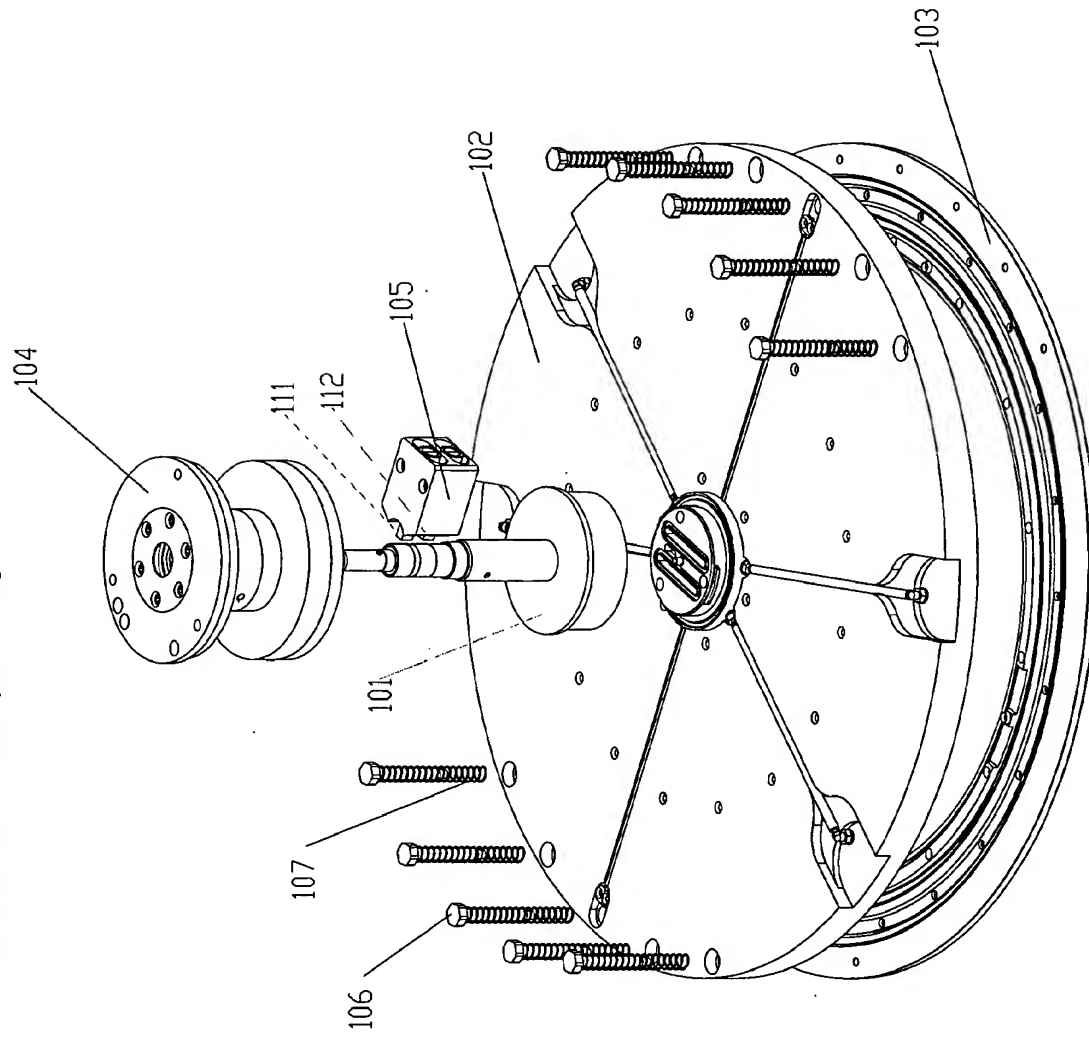


FIG. 1

Title: Two Electrode Chuck for Improving Removal Rate Uniformity During Electropolishing  
Inventors: Felix Gutman, Himanshu J. Chokshi, Mark Jacobus Van Kerkwyk, , Hui Wang  
Date: July 13, 2004

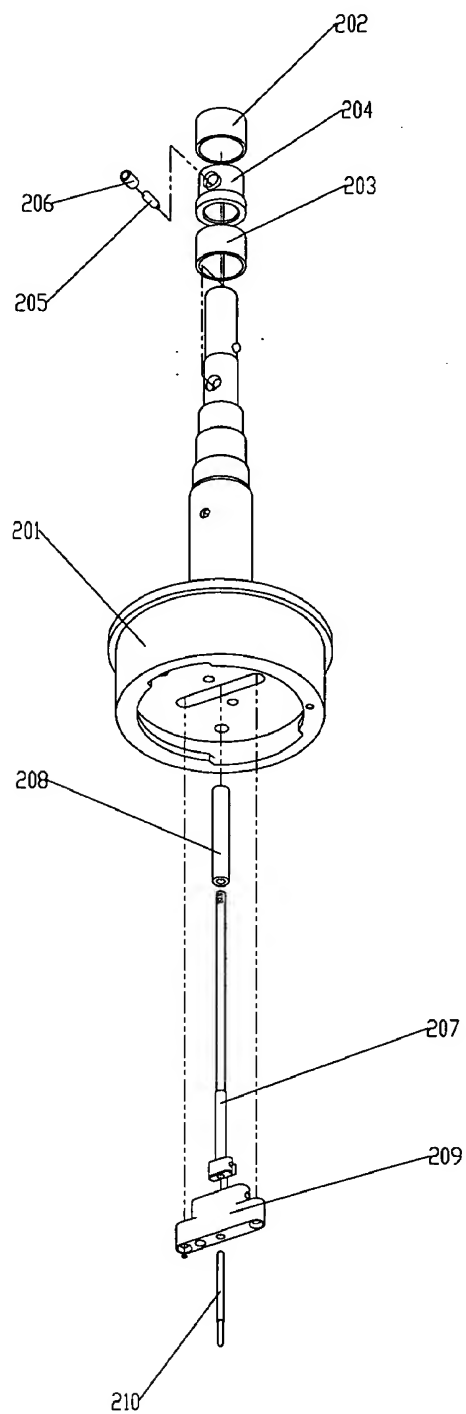


FIG. 2

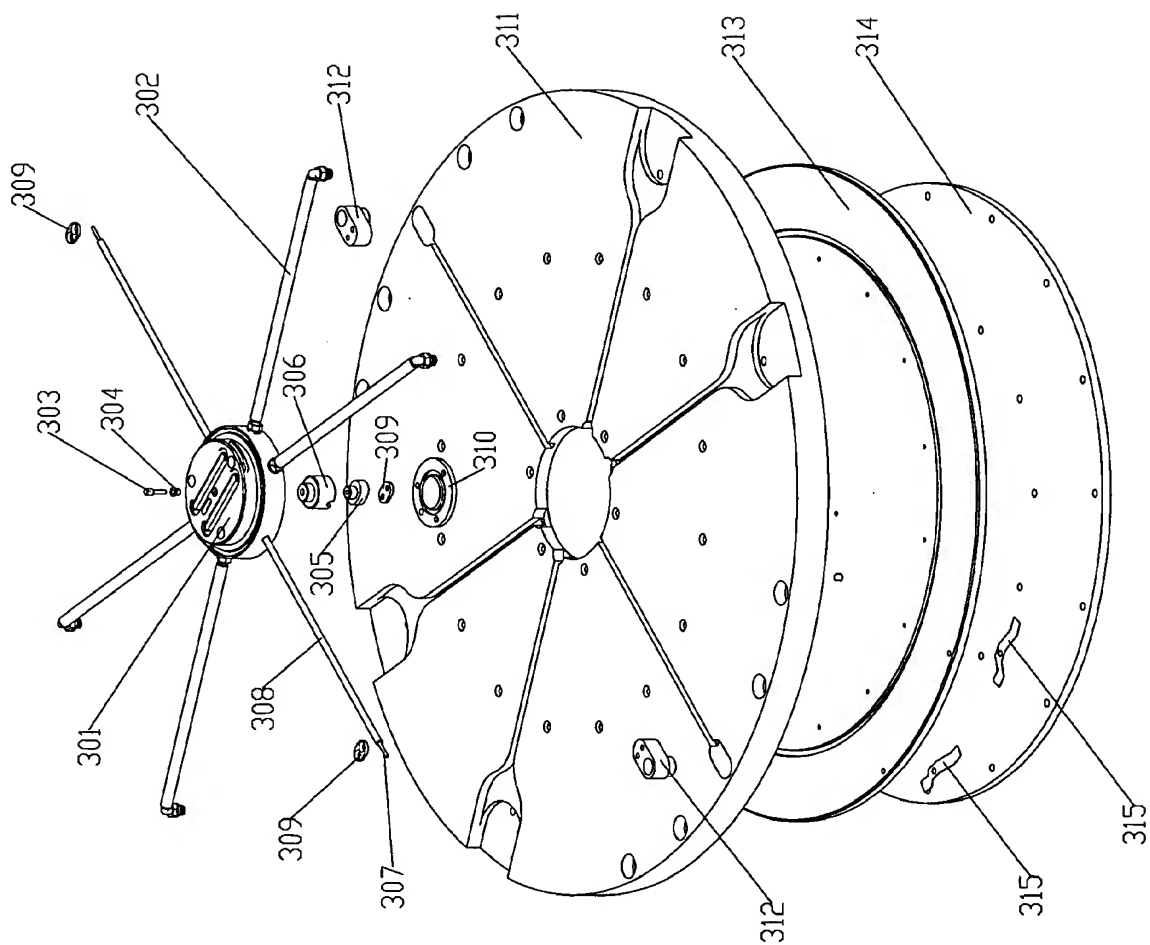


FIG. 3

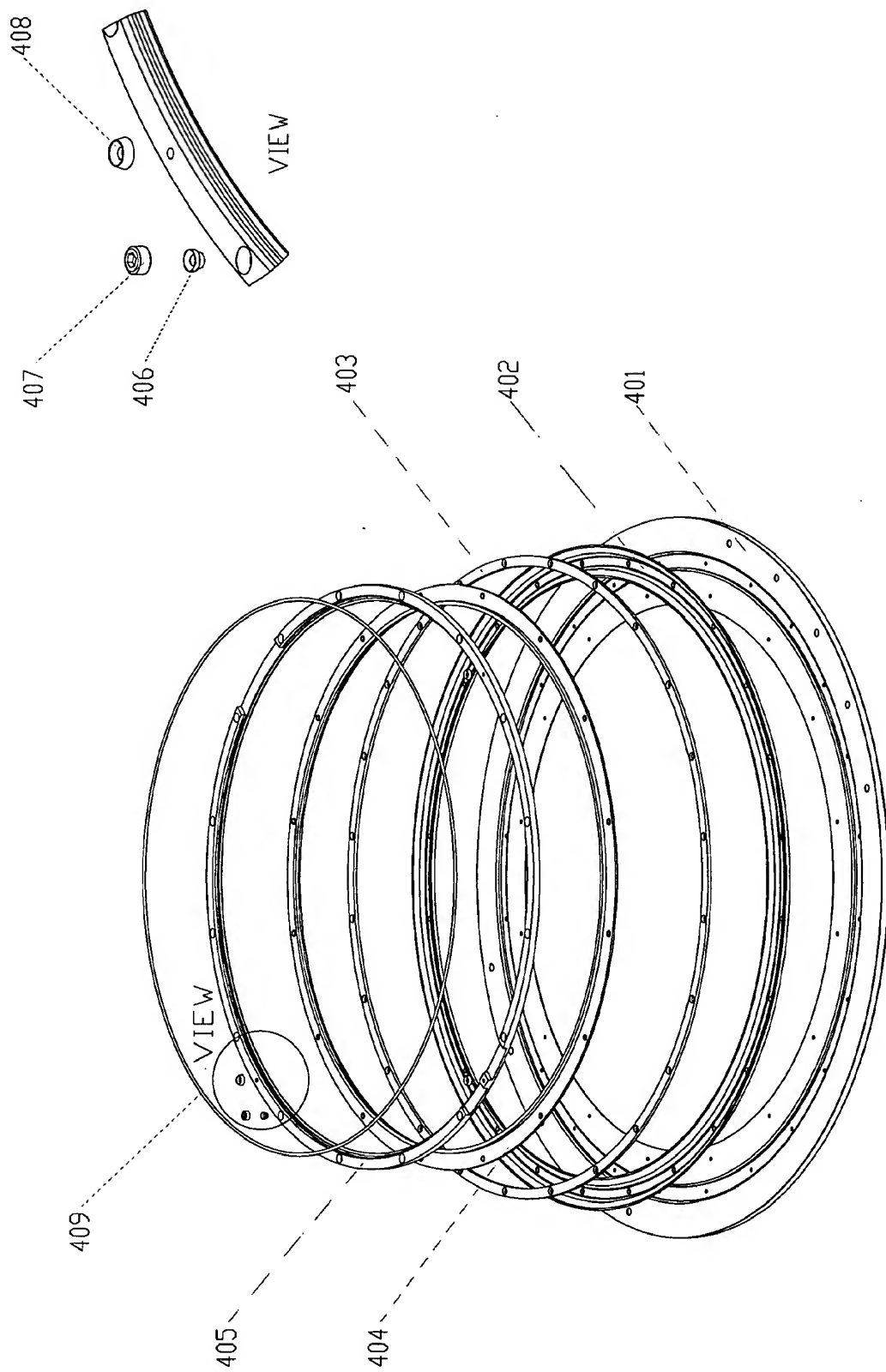


FIG. 4

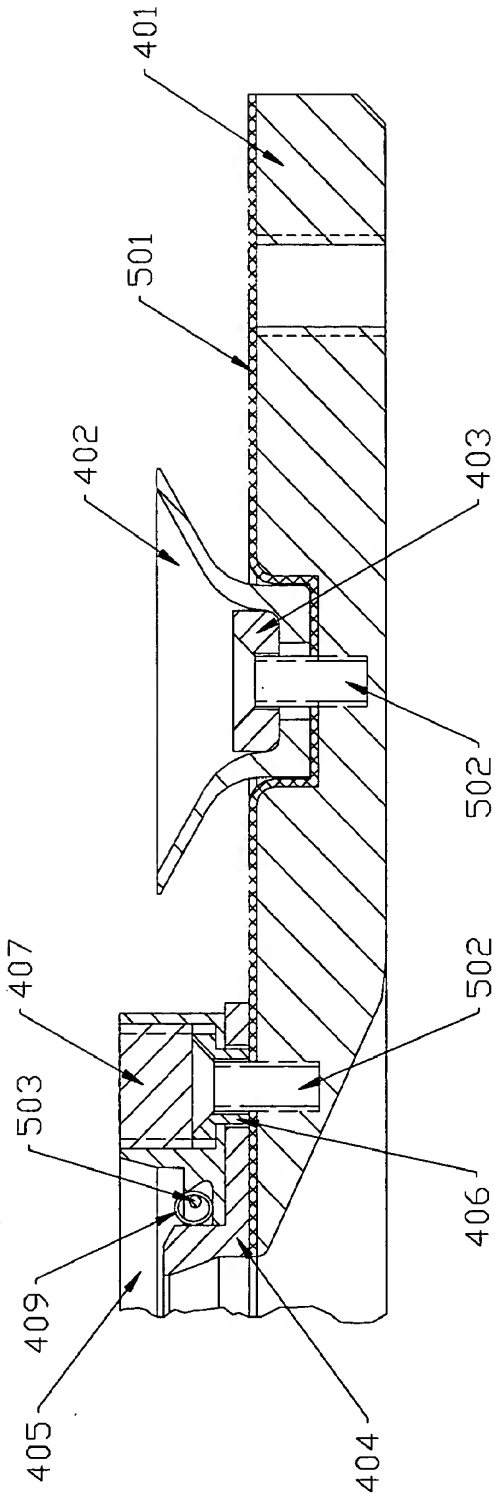


Fig. 5

## Application Data Sheet

### Application Information

Application Type:	Provisional
Subject Matter	Utility
Suggested Classification:	
Suggested Group Art Unit:	
CD-ROM or CD-R?:	
<del>Number of CD disks</del>	
Number of copies of CDs:	
Sequence submission?:	
Computer Readable Form (CRT)?:	
Number of copies of CRF:	
Title:	Two-Electrode Chuck for Improving Removal Rate Uniformity during Electro- polishing

Attorney Docket Number:	
Request of Early Publication?:	
Request for Non-Publication?:	
Suggested Drawing Figure:	
Total Drawing Sheets:	5
Small Entity:	Yes
Petition included?:	
Petition Type:	

### Applicant Information

Application Authority Type:	Inventor
Primary Citizenship Country	USA
Status:	Full Capacity
Given Name:	Felix
Middle Name:	
Family Name:	Gutman
Name Suffix:	
City Residence:	San Jose
State or Province of Resistance:	CA
Country of Residence:	USA
Street of Mailing Address:	46520 Fremont Blvd., Suite 610
City of Mailing Address:	Fremont
State or Province of Mailing Address:	CA
Postal or Zip Code of Mailing Address:	94538

### Correspondence Information

Correspondence Customer Number:	
Name:	David Hui Wang, ACM Research, Inc.

Street of mailing address: 46520 Fremont Blvd., Suite 610  
City of mailing address: Fremont  
State or Province of Mailing Address: CA  
Country of mailing address: USA  
Postal or Zip Code of Mailing Address: 94538

Phone number: (510) 445-3700  
Fax number: (510) 445-3708  
E-mail Address: [dwang@acmrc.com](mailto:dwang@acmrc.com)

#### **Representative Information**

Representative Designation	Registration number:	Name
Primary	44417	Peter J. Yim

#### **Domestic Priority Information**

Application:	Continuity Type:	Parent Application	Parent Filing Date:

#### **Foreign Priority Information**

Country:	Application Number:	Filing Date:	Priority Claimed

#### **Assignment Information**

Assignee name: ACM Research, Inc.,  
Street of mailing address: 46520 Fremont Blvd., Suite 610  
City of mailing address: Fremont  
State or Province of Mailing Address: CA  
Country of mailing address: USA  
Postal or Zip Code of Mailing Address: 94538